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SUBJECT MATTER INDEX OF APPLI- CATIONS FOR PATENTS.

June 21st to July 20th inclusive.

The following Index gives first the class, then the name of the inventor, and No. of the application. In this list (com.) means invention communicated from abroad. Further information as to the progress of these Patents by Notice to Proceed, Sealing, and Specifying, can be obtained at the Office, 21, Cockspur Street, Charing-cross.

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 SHIRTS, Collars, &c.—D. P. Belknap, 2813.
 SHOT, Shell, Bullets, Cartridges, Percussion Caps, &c.—C. A. McEvoy, 2497.
 SIGNALS, &c.—B. Coyle, 2397. W. R. Lake (com.), 2470. W. H. Willats, 2495. J. White, 2514. A. W. Rose, 2641. A. M. Clark (com.), 2726. J. Blomerley, 2817. F. Peterson and J. H. R. Dismore, 2887.
 SLABS, &c.—R. W. Hitchins, 2772.
 SOAP, &c.—A. M. Clark (com.), 2758. G. F. Redfern (com.), 2936. W. R. Lake (com.), 2835.
 SOUNDINGS, &c.—W. R. Lake (com.), 2877.
 SPINNING and Preparing for Spinning.—J. Nuttall and J. Tapley, 2417. J. Haigh, W. Dean and T. W. Mitchell, 2600. R. Scarfe, 2707. S. Tweedale, 2799. H. Yates (com.), 2800. S. Mock, 2928.
 STABLES, &c.—T. Ernst, 2581.
 STAYS, &c.—A. Ottenheimer, 2418. G. Wrencher, 2572. W. H. Taylor, 2610. S. Dixon, 2891.
 STEAM and other Boilers, Cleaning and Preventing Incrustation of Boilers, Water Feeding Apparatus for Boilers.—A. Engert, 2633. F. Brown, 2635. H. Aydon and E. Field, 2727.
 STEAM Engines (Stationary, Locomotive, and Marine).—W. Dawe, 2489. B. J. B. Mills (com.), 2811. G. Allan and R. E. Dickinson, 2890.
 STEERING and Guiding, &c.—A. W. Pattie and G. W. Robertson, 2424. J. Cook and W. Prosser, 2552.
 STRAPS.—J. Brooks, 2821.
 SUGAR and Syrups, Glucose.—E. Hunt, 2586. J. M. Cameron and H. J. Anderson, 2725.
 SULPHUR, &c.—G. Hislop, 2730.
 SURGERY, &c.—W. A. Barlow (com.), 2797.
 TAPESTRY, &c.—D. A. Guille, 2566.
 TARGETS.—R. Morris, 2732.
 TEACHING.—J. W. Cook, 3028.
 TELEGRAPHS; Telegraph Printing Apparatus.—J. Imray. (com.), 2428. W. R. Lake (com.),

2437. C. Moseley, 2451. W. R. Lake (com.), 2466. S. P. Thompson, 2578. A. W. Rose, 2641. H. Alabaster, T. Gatehouse and H. R. Kempe, 2675. L. Varicus (com.), 2644. H. H. Lake (com.), 2760. W. R. Lake (com.), 2804. W. H. Snell, 2905. J. G. Lorrain (com.), 2907.

THERMOMETERS, Barometers, Pyrometers, &c.—T. H. Engel (com.), 2856.

THRASHING Machines, Reaping Machines—P. Gibbon and A. Robinson, 2460. J. H. Johnson (com.), 2547.

TILLING and Cultivating, &c.—W. Doubleday, 2529. G. P. Blake, 2605. W. H. Sleep, 2633. J. Howard and E. T. Bousfield, 2629. T. Morgan (com.), 2702.

TRAMWAYS, &c.—T. E. Knightley, 2716. J. Wright, 2919.

UMBRELLAS, Parasols, &c.—J. Wetter, 2650. B. B. Avery, 2874. S. Dixon, 2891. B. J. B. Mills (com.), 2931. J. Feldman, 2937.

UPHOLSTERY, &c.—R. Henry, 2447. T. Wilson, 2814.

VALVES, Taps, Stop Cocks, Plugs: Regulating the Flow and Pressure of Fluids.—J. W. Joyce, 2455. E. Edwards, 2832. S. and G. Chisholm, 2837. T. H. Ward, 2848. E. M. Simpson (com.), 2878. J. Nixon, 2904.

VELOCIPEDS.—T. J. Cocks, 2393. H. H. Hazard, 2406. L. C. Tipper, 2487. J. Simon-ton, 2504. R. Wood and J. White, 2680. C. H. Brooks (com.), 2697. W. Dixon, 2774. R. Neal, 2860.

WASHING, &c.—M. and T. Staveley, 2522. M. Cockburn, 2728.

WATER-CLOSETS, &c.—J. Casey, 2717. A. M. Clark (com.), 2834.

WATERING, and Irrigating, &c.—J. H. Johnson (com.), 2850. W. R. Lake (com.), 2927.

* * * The above List is prepared from the Patent Records by Mr. T. Morgan, Secretary of the Inventors' Patentright Association, Limited.

SCIENCE TEACHING.—The prizes and scholarships gained in the Normal School of Science and Royal College of Mines were distributed recently by Mr. Mundella, M.P., Vice-President of the Council, in the theatre of the South Kensington Museum. There was present a large attendance of ladies and gentlemen. Professor Huxley, as dean of the School, briefly addressed the meeting, remarking that the Institution had arisen out of the growth of independent organisations set on foot by the Government in order to give physical science the influence upon the industries of the country which is absolutely essential to their sound and rapid progress. While the department showed undoubted advantages and progress on the art side, and was in a very vigorous condition, he could not but think that it lacked efficient teachers and a necessary appreciation of the importance of scientific teaching in different parts of the provinces where manufactures are conducted. Mr. Mundella, having distributed the awards, remarked upon the slowness in growth of science teaching in this country as compared with the teaching of art. He was glad, however, to know that English manufacturers are beginning to recognise the fact that in this respect they are getting far behind their Continental competitors, who have in late years made prodigious efforts to apply science to industry. Technical education, Mr. Mundella said, was largely occupying the attention of the Government, and the report of the Royal Commissioners, who have been inquiring into the subject, will be not only interesting, but startling. While saying this, he did not doubt that this country would be able to hold its own in the future, as it had in the past, as far as scientific teaching applied to manufacture. Thanks were awarded to the Right Hon. gentleman for presiding, and the proceedings terminated.

An improvement in cultivators has been patented by Mr. Francis O. Williams, of North Cohocton, N.Y. The object of this invention is to prepare ground to receive seed and cultivate the plants.

Correspondence.

TO THE EDITOR OF THE SCIENTIFIC REVIEW PRIVATE INTEGRITY INSURANCE AND GUARANTEE COMPANIES.

SIR.—These most useful and important companies stand at precisely the same relation (one of indemnity and protection), to individuals separately as Public Integrity Insurance and Guarantee companies stand to individuals collectively. With the latter companies the risk of loss to shareholders in the two possible events of collapse or of bankruptcy is reduced to a minimum, while with the former companies the risk of loss from dishonesty or other cause is equally reduced to a minimum. In fact, Private Integrity Insurance and Guarantee Companies are gigantic sureties entirely superseding for many reasons all private sureties, and, in short, standing bail to the whole community. In all the manifold business transactions of life, wherever trust, character, credit, confidence, and integrity are involved, these companies introduce and infuse the elements of security, certainty, and safety. An actuary has only to calculate the yearly amount of premium which must be paid to illustrate their usefulness and importance. We would instance the case where a youth applying for a junior situation in a bank, and who by the custom of bankers is requested to find two sureties in a thousand pounds. Thousands of persons are thus yearly ruined at the very commencement of life from their total inability to find their sureties.—I am, Sir, your obedient servant,

AUGUSTUS J. HARVEY.

6, Cromwell Terrace, Southtown,
Great Yarmouth, June, 1882.

A NEW ELECTRIC GAS LIGHTER.—The General Electric Apparatus Company, of 33, Aldermanbury, have brought out an electric gas lighter, the invention of Messrs. Clarke and Leigh, of Manchester, for which many advantages are claimed. An ebonite handle, divisible into two parts, contains a battery and coil, both of which are specially improved for the particular purpose of the arrangement. The former is a chloride of silver cell; the salt being compressed instead of fused, as usual. The advantage of this battery is that it does not waste by local action when the circuit is broken; and the practically complete absorption of hydrogen in the brief and intermittent working permits of the whole being hermetically sealed up. The cell contains a charge sufficient to last for at least 25,000 ignitions; and when exhausted it is easily replenished, at slight cost, with fresh chlorides. In connection with the battery is an induction coil with make-and-break action, and provided with an exterior button, which, upon being pressed, makes an automatic temporary contact, sufficient to pass a spark for lighting one gas burner. The spark is produced between two metallic points, resting on a piece of terra-cotta, at the end of a brass rod of any convenient length or shape which may be required for the purpose of lighting burners in different situations. The special advantages of this arrangement are claimed to be its neat and solid construction, offering little risk of getting out of order, and the simplicity and sound scientific combination of parts and materials in the battery and induction coil. It shares with other electrical lighters in the qualifications of cleanliness and perfect security from fire, while it is claimed to be pre-eminently economical, practically inexhaustible, and not liable to give trouble.

SPEED OF EVAPORATION OF PURE WATER.—A. Muller has devised for this purpose an especial hydrostatic balance, which he names the xerometer.

GLASS AS A BUILDING MATERIAL.

PERHAPS not one builder or contractor in ten, if told that the common grades of glass made at the glass factories in this city have a crushing strength nearly four times as great as that credited by experienced engineers to the strongest quality of granite, would accept the statement as true. Yet it is fact, and being so, the query as to why glass has not received more attention from architects as a structural material naturally suggests itself. A reporter, as stated in an article headed as above in the *Pittsburgh Dispatch*, had a talk with several prominent glass manufacturers on the subject, and in answer to an interrogatory as to whether blocks of glass could be made in suitable lengths and sizes and so annealed as to be utilized in the construction of a building in place of stone, they said that it could be done. Said one of these gentlemen: "This question has been considered by myself a number of times and, although I do not want to advocate the absolute abolition of brick and stone, yet in the erection of art galleries, memorial buildings, &c., a structure composed of blocks of glass in prismatic colours would be a unique, beautiful and lasting structure. With the numerous inventions which have come into use of late years in connection with the production of glass, the cost has been gradually going down, while the quality of the fabric is steadily becoming better. Now, as the Smoky City controls the bulk of the glass production, there could not be a more appropriate place for the erection of such a building."

One objection which would be raised to the durability of a glass house, in the literal sense of the words, might be that the blocks would not take a bind, or adhere together with common mortar. This objection can be readily set aside by the use of a good cement, and when completed the structure will stand for ages, barring extraordinary accidents or mayhap cataclysm. As to the cost of a glass house, it can be kept down to but a small percentage above the price of cut granite, as there are many points where saving gains can be made. Thus, for instance, in building with stone you have to pay the stone masons, and when it comes to elaborate examples of carving, in Corinthian pillars, collars and capitals, &c., why, the work is rather costly as compared with glass, when the latter can be moulded into any shape or form, and the work accomplished in much less time. I am convinced that the time will come when we will see such a building erected. Scarcely a day passes but what the sphere of glass as an article of use becomes widened.

In parts of Germany, and on one line in England, glass ties are being used on railroads, and thus far have given satisfaction, combining all of the requisites of wooden ties with the virtue of being susceptible to usage at least seventy-five per cent. longer than wood. Then by the Bastia process, glass articles are now being made for common use which can be thrown on the floor and will rebound like a rubber ball. Progress is also being made toward rendering glass, which has even been characterized as "the brittle fabric," ductile, and to-day threads of glass can be made that can be tied in knots and woven into cloth. Were one disposed to give play to fancy, and fuse it into fact, a house entirely composed of glass could be built with walls and roofs and floors fashioned from melted sand. Carpets of glass could cover the floors, the wall decorations embodying the forms and colours of the most ultra aesthete, sitting on glass chairs or reclining on glass couches, arrayed in glass garments, eating and drinking from glass dishes, such an one could realize that the age of glass had come. Yet nearly all of this, fifty years ago, would have been classed with the then impossible telephone and electric light, and this state-

ment would have likely found its place in the *index expurgatorius*.

Much has been said about the inability of modern glass manufacturers to make window glass imbued with the rich and beautiful colours peculiar to the windows of old cathedrals in England and on the Continent. It is not generally known, however, that the secret of securing those wondrous tints has been discovered by one of our glass manufacturers. After a long series of experiments conducted in conjunction with Mr. Thomas Garfield, of Boston, a cousin of the martyr President, he has found that the rich effects in those old cathedral windows are owing to the poorness of the quality of the glass. Owing to the imperfect mixing of the ingredients by the old glass-makers, the substance did not unite closely, and in consequence it became porous, and the minute particles of soda in the composition are exposed and act in the function of radiators, which give brilliancy to the colours of the window. In making window glass in colours, now, the makers prefer to leave the surface rough, in order that by exposure to the elements it may go through the same beautifying process alluded to above.

Pittsburgh Dispatch.

A NEW GAS LAMP.—Another endeavour to raise the position of gas as a rival of electricity appears in an invention by M. Clamond, in which the gas is burnt with air heated to 1,000 deg. C., the combustion taking place within a cone or basket of magnesium wire, which, raised to incandescence, forms a high-centre of remarkable softness, steadiness, and brilliancy. This result is obtained as follows:—A gas or steam pump drives a blower, giving the required air under pressure (which air has a pipe-system distinct from that of the gas). Before reaching the burner, the air traverses a tube of refractory matter kept at a temperature of 800 deg. to 1,000 deg. C. by a number of small gas-flames about it, and thence it passes into a chamber, where the gas joins it. M. Clamond has succeeded in so grouping the heating and mixing chambers that the whole burner may be enclosed in a cylinder about 2½-in. in diameter and 4½-in. in height. One horse-power, it is stated, suffices for an illumination of 150 to 200 Carcels. One Carcel requires, with various burners, 27 to 45 litres of gas. The magnesium has to be replaced every 40 or 50 hours, and this is rendered easy. Whether the system will work anything like a revolution in gas-lighting may be doubted.

A NEW HYGROMETER.—In a recent note to the Paris Academy, M. Crova has described an instrument for measuring the moisture of the air not subject to the uncertainty characterising the indications of previous instruments when the air is agitated. The observer looks through a tube towards a source of light. This tube is of nickel-plated brass, highly polished within, closed at the further end with ground glass and at the nearer with a lens. The ground glass plate appears as a luminous disc, and the polished interior, by its reflected light, has the aspect of a bright annular space round the disc. The air whose moisture is to be ascertained passes slowly along the tube, entering and leaving by tubulures at the ends connected with a suction arrangement. To cool the tube, it is surrounded by a metallic sleeve filled with a sulphide of carbon, through which an air current is passed. A thermometer is inserted in this liquid. When the temperature of the air under examination reaches saturation, dew is deposited, appearing like dark brown spots, which contrast strongly with the bright disc when seen directly. A gradual rise of temperature makes these disappear, and thus, by repeated appearances and disappearances, the dew-point may be estimated with an approximation of one-tenth of a degree.

RECENT AMERICAN AND FOREIGN PATENTS.

Window Protectors.—Mr. John Owen Smith, of Savannah, Ga., has patented a means for protecting windows or doors against the efforts of burglars to break in. It consists in a strong protective frame of metal or wood, provided with lugs at the top, adapted to enter seats formed in plates in the sides of the window frame, and provided with tongues of metal at the bottom, projecting at right angles to the frame inwardly, and adapted to enter horizontal holes in the window-sill and be locked by set screws or pins inside.

A **neck yoke attachment** has been patented by Mr. Harrison Hough, of Darlington, Wis. This invention relates to improvements in devices for preventing a wagon tongue from accidentally becoming detached from the neck-yoke and dropping to the ground; and it consists in a spring safety hook, the inner end of which is secured to the under face of the tongue. The spring hook is provided with a slot through which the holdback passes; the tension of the spring hook causing its hook to bear against the tongue near its outer end. By this construction all liability of the neck-yoke becoming detached from the tongue is obviated, the ring of the neck-yoke being prevented from slipping off the outer end of the tongue by the hook, and prevented from slipping backward by the holdback, and the spring safety hook can readily be applied to a tongue with the ordinary holdback.

A **heater and cooler** has been patented by Mr. Charles W. Payne, of Center, Ark. The object of this invention is to heat beer, milk, or other liquids in cold weather, or cool liquids in hot weather, by partly immersing in said liquids a vessel of peculiar construction, through which a current of hot water or steam, or cold water is made to circulate and be discharged therefrom without coming in contact with the liquid to be heated or cooled.

A **mechanical musical instrument** has been patented by Mr. Robert W. Pain, of New York city. This invention relates to organs and other wind musical instruments which are mechanically played or controlled by one or more strips or sheets of paper or other suitable material perforated to represent the different notes or sounds it is desired to produce, and caused to pass automatically over air ducts, which, accordingly as they are opened by the perforations in the paper that has a valvular action relatively to such ducts, causes the reeds or other sounding devices to be played as required. The invention applies to instruments of this description in which an air compression pump or bellows is used as distinguished from an exhaust bellows. The invention consists of a cap having secured along its opposite side edges strips of organ leather, rubber, or other suitable flexible material of sufficient width to extend inward from each side to the tubes of the action board, so that the compressed air with the box or reservoir pressing down on the flexible strips will hold them upon that part of the perforated music sheet that is passing beneath them in such a manner that no air can escape from the box, excepting through the tubes or passages of the action board.

A **shirt adjuster**, that can be readily attached to and detached from the skirts, has been patented by Nannie C. Green, of Brooklyn, N. Y. The invention consists of two pieces of webbing provided with spring clasps for securing the webbings detachably to the edges of the skirt seams, the webbings being provided with rings or eyelets to receive lacing strings, by means of which the skirt is adjusted.

A **shuttle box for looms** has been patented by Messrs. Levi L. Lukens, of Chester, and Henry Holcroft, of Media, Pa. By a peculiar construction the second spindle, as ordinarily used, is dispensed with, and by

this means the inventors are enabled to increase the width of the picker-strap, as desired, which in itself is an important advantage. By dispensing with the ledgers, as ordinarily employed, the inventors are enabled to dispense with cutting the recess in the picker, thereby leaving it stronger.

A **faucet**, which can be fastened in the barrel without striking or hammering, has been patented by Mr. Albert Ruehe, of New York city. The faucet is provided with an upright arm near its inner end, which is passed under a catch on the upper end of a plate fastened to the head of a barrel, and provided with a bushing fitting in the bung hole, upon which the outer end of the faucet is pressed, so that the inner end forces the cork into the barrel, when a handled ring mounted loosely on the faucet and provided with a bevelled cam is turned, forcing the annular shoulder of the faucet against the plate on the barrel head.

An **earth scraper** has been patented by Mr. Jasper N. Nutt, of Sidney, Ohio. The scoop is of ordinary construction, and is provided with the usual wooden back, but for securing these parts securely together two curved angle plates are employed, which are riveted or bolted to the outer surface of the back and to the curved portions of the scoop. The scoop is further strengthened by cross braces at the back and a shoe on the bottom.

Coffee Pots patented by Mr. Jesse L. Fusner, of Bellaire, Ohio, consist in the combination, with a coffee pot, of an inclined crescent-shaped shelf, secured to the inside of the pot below its spout, and provided with perforations near its inner edge, to prevent the grounds from covering the strainer.

Boot Straps.—Mr. George B. Siegenthaler, of Wooster, Ohio, has patented an improvement in boot straps for leather boots which consists of a strip of leather having its central portion folded to form three thicknesses and its folds suitably secured in place, and provided with the end slits, forming two tongues at each end of the boot strap, the planes of which are at right angles to the flat middle portion of the strap.

Oiling Machinery.—Messrs. Thomas M. Righter, of Sandy Run, and Thomas R. Griffith, of Wilkesbarre, Pa., have patented an improved can for use in oiling machinery. It is designed to prevent accidental or careless waste of oil. The invention consists in the combination with an oil can of a discharge tube or nozzle extended down into the can, nearly to the bottom and provided with a bell-shaped mouth at its lower end, and a ball valve for closing the lower end when the can is turned from an upright position.

A **door securer** has been patented by Mr. John J. Tierney, of New York city. This is an ingenious arrangement of a screw and guard plate for preventing access to the screw. The guard plate is held in position by the bolt of the door lock.

A **spring-hinged bracelet** has been patented by Mr. Abraham H. Engel, of New York city. The invention consists in the combination, with the two parts of the bracelet connected by a hinge and the spring, of the lug bevelled upon its opposite sides, whereby the parts of the bracelet will be held in position, both when opened and when closed, by the tension of the spring.

An improved **peanut picker and cleaner** has been patented by Mr. Everitt H. Powell, of Buckhorn, Va. This invention is an improvement in that class of machines for removing peanuts from vines, and also cleaning them, which have fixed and vibrating screens and a vibrating shoe and fan blower arranged beneath the same. This inventor employs in addition to these an endless travelling apron or carrier for delivering the cleaned nuts into a receptacle provided for the purpose; but the particular feature of novelty and superiority of this machine consists in the arrangement where-

by the screens, shoe, apron, &c., are operated.

Stop watches patented by Mr. Charles H. Audemars, of Brassus, Switzerland, consists in the use of two pinions placed between the usual pinions, by which the stop-watch hands are driven from the second hand of the watch, such two pinions fitted for being connected and disconnected with each other, and retained in either position by springs acting endwise of the arbour, with the result that the pinion gearing to the second hand arbour is continuously in motion.

Locking nuts upon bolts, patented by Mr. Albert R. Clark, of Amite City, La., consists in first flattening one side of the bolt near the face of the nut and then casting a metal ring around the bolt, so that a portion of the ring will rest in the flattened portion of the bolt.

A barrel stave jointer, patented by Mr. Robert O. Dobbin, of Berlin, Ontario, Canada. In this machine the stave is carried over a circular saw by an overhanging carriage, which is swung laterally so as to give the proper curvature to the edge of the stave. The swinging is effected by an arrangement of guides on the saw table.

Link for horse powers has been patented by Mr. Barnard L. Olds, of St. Albans, Vt., relating to the means by which the lags are secured to the jointed links of the endless treads in horse powers; and it consists in loops or stirrups forming part of the links and engaging slotted lags, by which arrangement lags of uniform construction may be used and the use of bolts may be avoided.

Sawmill log-carriages, has lately been patented by Mr. Morgan B. Campbell, of Beverly, W. Va. This invention facilitates the setting of logs on sawmill carriages, and renders the handling of logs in the mill a simple and easy operation.

A machine for dressing box straps and barrel and tierce hoops split from poles, has been patented by Mr. Samuel R. Garner, of Cassville, Wis. The invention consists in certain novel features in the feeding mechanism and in new mechanism for holding the hoop up to the cutter.

A baling press has been patented by Mr. Louis Ensinger, of Little Elm, Texas. This press is operated by racks and pinions, the latter being driven by worm gear. The press has a quick return motion, and has novel devices for filling and discharging.

An improvement in *compass saws* has been patented by Mr. Charles Bush, of New York city. The invention consists in a blade tapered from the centre toward each end, curved transversely, with a curve gradually decreasing in size from the centre toward each end, and pivoted at its centre by a clamping screw to a handle grooved upon its opposite edges, so that larger and smaller curves can be sawed by the same saw, and a curved kerf can be continued in a curve in the opposite direction.

A cloth-measuring machine has been patented by Mr. Albert Winter, of Plainfield, N. J., and relates to machines of the class in which revolving drums are used for measuring cloth as unwound from rolls. This invention insures accuracy by employing devices for clamping the cloth to the drum as it progresses through the machine.

An improved *cultivator* has been patented by Mr. Montgomery C. Meigs, of Romney, Ind. In this implement the stalks of the corn being cultivated are made to regulate the width of the cultivator.

A piano sounding-board attachment has been patented by Mr. John G. Seebold, of Montreal, Quebec, Canada. The object of this invention is to provide a sounding-board attachment whereby the quantity and quality of the tones will be augmented and equalized. The invention consists in the combination with a sounding-board of an upright strip furnished with an aperture for each string between the bridge and the

hitch-pin block, the strings resting against the upper edge of the apertures.

An improved *floor-covering*, patented by Messrs. Charles T. Meyer and Victor E. Meyer, of Jersey City, N. J., is made of a fabric covered with a coating of a mixture of ground leather or analogous fibre with mineral fibre and a binding material, such as a hard varnish. The same inventors have patented a floor-covering made of a fabric covered with a coating of mixture of ground wood or other vegetable fibre with mineral fibre and a binding material, such as copal or other varnish.

Road-scraper.—George Gregory and George Austin, of Skaneateles, N. Y., have patented an improved road-scraper which can be guided and directed very easily and can be adjusted in its inclination to the road.

A *mechanical musical instrument* has been patented by Mr. Robert W. Pain, of New York city. This invention relates to organs and other wind musical instruments which are mechanically played or controlled by means of one or more strips or sheets of paper or other suitable material perforated to represent the different notes or sounds it is desired to produce, and caused to pass automatically over air ducts or tubes, which, accordingly as they are opened by the perforations in the paper that has a valvular action relatively to said ducts or tubes, cause the reeds or other sounding devices to be played as desired. The invention consists in an arrangement by which the bellows or air reservoir is fed or exhausted, as the case may be, by pumps or feeders placed beneath the action board, the connection from the pumps or feeders to the bellows being preferably made by means of a wind trunk placed in one or both ends of the action board. It also consists of a rotating toggle-shaft connected to the hand crank of the instrument, carrying toggles arranged so as to operate in alternation their respective pumps or feeders, whereby a continuous supply of air is furnished to the air reservoir or bellows.

Bridges.—Mr. Justus H. Ibel, of Marshall, Texas, has recently patented an improvement in bridges which is applicable to both iron and wooden bridges, and not only facilitates the construction, but insures a strong secure structure.

A sluice box for use in placer mining and for working tailings from quartz mills has been patented by Mr. Cornelius Driscoll, of Pioche, Nev. The invention consists of a box containing a series of connected steps or platforms, rising one above another in horizontal planes, and provided with transverse stops or riffles, the said box being provided with a partial or complete lining of sheet copper or blankets, according to the use to which it is applied.

Platform gear for waggons has been patented by Mr. Edward Clark, of New York city. The object of this invention is to provide for trucks and waggons durable and substantial platform gear less expensive than the leaf-spring gearing generally employed; and the invention consists in a platform of novel form, supported on both light and heavy spiral springs.

Mr. Thomas C. Steward, of Chattanooga, Tenn., has patented an improved *car coupling attachment* which is simple, convenient, and permits of coupling cars by means of the ordinary link and drawhead without requiring the operator to enter between the cars and endanger his life. This invention is an improvement on the car coupling attachment for which Letters Patent No. 236,855 were issued to the same inventor on the 18th day of January, 1881, and it consists of a bar or lever provided with an adjustable handle and pivoted to a collar loosely mounted on one end of a J-shaped bar attached to the end of the car, this bar being of such length that it can catch under the link of a drawhead and lift the link, so that it can enter the draw-head of the next car.

Mr. Henry A. Sessions, of Palestine, Tex., has patented an improved *hand car* in which the arrangement of the cranks and levers is such that the maximum amount of the power exerted upon the levers by the operators will be applied to the propulsion of the car, in other words, the object is to overcome largely the loss of power incident, through indirect action of the levers and unnecessary friction, to the common construction of car.

Mr. Henry Roth of New York city, has patented a novel self-lubricating *car axle box* in which the concave or friction surface of the brass and the journal upon which the brass rests will be kept lubricated so long as there is any lubricant in the journal box. This end is accomplished by a peculiar arrangement of capillary conductors which constantly draw up and deliver to the journal the required amount of lubricant. The same inventor has patented a device for preventing the lubricant from escaping from the journal boxes, and preventing dust from entering them, also to facilitate the insertion of the lubricant.

SCIENTIFIC EXPEDITION TO CAPE HORN.—The meteorological mission to Cape Horn, organised by the French Government, will shortly start. Two medical men, Drs. Hyades and Han, are included in it, and have offered the Academy their services for making collections and observations. In view of the great importance of zoological, botanical, and geological researches at Cape Horn, a committee of the Academy expressed the wish that three specialists for these could have been appointed; but this being impossible, by reason of limited resources, the committee have urged that a preparer of collections (M. Sauvinet is designated) be appointed as assistant to Dr. Hyades. Zoological instructions to the members of the mission, by M. Alphonso Milne-Edwards, are given in *Comptes Rendus*. The large mammalia—seals, otaries, sea-elephants, &c.—some of which are rapidly disappearing—are recommended as specially deserving of attention; and, *inter alia*, a study of the natural history and relations of various penguins, of petrels, albatrosses, cormorants, and other sea-birds, of fishes of the genus *Notothenia*, of various crustacean, molluscan, and zoophyte species, promises to be highly fruitful. The expedition will sojourn for more than a year in the south of the Magellanic Archipelago, having thus a better opportunity than usual of enlarging our knowledge of those regions.

STEEPING OF BARLEY.—It is generally supposed that hard waters remove less from barley during steeping than soft waters; in order to determine the correctness of this supposition, Ullik steeped some barley in distilled water, in river Elbe water, in a temporary hard well-water, and in two samples of water containing gypsum. All the waters removed more potash than distilled water, but soda was removed in the greatest amount by the gypsum, and distilled water and magnesia by the hard waters, as also the lime. Ullik gives the following explanation of the removal of the bases: The phosphoric acid exists in the barley partly as an insoluble compound with lime and magnesia, and the rest as soluble a primary, and secondary potassium compound, and the primary calcium and magnesium phosphates. Now, as the barley contains free acid, it follows that a conversion of the secondary potassium phosphate into primary takes place; this phosphate is then precipitated by the calcium carbonate in the hard water, if the carbonic acid be removed. Soft water removes more organic matter from barley than hard, but the amount is small; whilst carbohydrates are removed most, nitrogenous matter is dissolved out the least by soft water. Finally, Ullik's investigations have shown that the duration of steeping has a greater effect on the barley than the quality of the water.

The Scientific Review

AND

SCIENTIFIC AND LITERARY REVIEW,

A RECORD OF PROGRESS IN

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SIR DAVID BREWSTER, K.H., LL.D., F.R.S., &c., from the establishment of the INVENTORS' INSTITUTE, till his decease, February, 1868. LORD RICHARD GROSVENOR, M.P. Sir ANTONIO BRADY, till his decease, 1881.

SESSION 1881—1882.

If any meeting be held special notice *per post* will be supplied.

Subscriptions are payable to Mr. G. A. STRETTON, the Receiver, 4, St. Martin's-place, S.W., who is the proper official to give receipts.

F. W. CAMPIN, Sec.

Proceedings of the Institute.

Dr. J. McGrigor Crofts's Paper on Screw Propellers is still reserved.

Monthly Notices.

Prof. William B. Rogers, of Boston, for many years honourably connected with American Science, recently fell dead while addressing an assembly in the hall of the Technological Institute. He was the son of Prof. Patrick Rogers, who held the chair of Natural Philosophy and Chemistry in William and Mary College, Virginia. He was a native of Philadelphia, and in his seventy-seventh year at the time of his death. His researches have been patient, and his contributions to science various and useful, and no doubt his writings will be collected. But it is as a teacher and a lecturer that the loss of Prof. Rogers will be most felt in Boston, for since the death of Agassiz he has had few equals there in that respect. The flourishing institution in which he died will always remain his monument. He was its original projector, and its laborious president through many years. Personally the late professor was much beloved in Europe as well as in America, and his hospitable home was dear to men of letters as well as of science. His widow is a daughter of James Savage, associated with the father of Emerson on the *Monthly Anthology* (1803-11), and author of various works on New England history. Many young men now doing good service in literature and science have reason to mourn the death of their truest benefactor as well as instructor in the indefatigable, genial, and enthusiastic Boston professor, whose life has terminated so characteristically.

David Scott, R.S.A.—It is proposed, says the *Athenæum*, to issue an illustrated volume dealing with the life and works of David Scott, R.S.A. The letter-press will consist of a biographical and critical essay by Mr. J. M. Gray, author of "George Manson and his Works," re-printed, with revision and considerable additions, from *Blackwood's Magazine*, and a carefully compiled catalogue of the artist's works, giving particulars as to their size, present owners, &c.

Mr. William Henry Simmons, the able engraver, who was born in London, June 11th, 1811, died recently. After many years of diligent study in this metropolis, he made his first appearance at the Academy exhibition in 1857 with prints after two pictures by Mr. Frank Stone. Since that date he has been a pretty constant contributor.

Martuinof's heirs have decided to print the whole correspondence relating to the duel by which the poet Lermontof was killed in 1841, and which unhappy affair deprived Russia of one of her brightest literary ornaments at the early age of twenty-three. All objections to the publication of the letters are considered to have been removed by the recent death of the last surviving second, Prince Vasil'chikof.—*Athenæum*.

Magnets.—Mr. Le Neve Foster, of Silvertown, has of late been studying the manufacture of permanent magnets. He has succeeded in producing some very powerful ones from steel containing from two to three per cent. of tungsten.

Cotton Oil.—Signor Marco Zecchini gives in *Les Mondes* an easy method for detecting cotton oil, with which olive oil is frequently adulterated. The suspected oil is treated with pure nitric acid, specific gravity 1.40. Ten cubic centimetres of acid are mixed with five of oil in a test tube closed by a cork of caoutchouc, and shaken briskly for a few moments. The tube is placed in an upright position and allowed to rest for five minutes. The oil collects on the surface; if it be pure olive oil it takes an ash-grey tint with a pale yellow reflection, if cotton oil it assumes immediately a golden yellow which soon becomes a deep coffee brown.

Snow and Ice.—Mr. Edward Hungerford communicates to the *American Journal of Science* his "Observations on Snow and Ice under pressure at Temperatures below 32° F." In this paper the results obtained by Profs. Faraday and Tyndall are fully confirmed, and many interesting facts connected with the formation of glaciers are given.

Death of Mr. Bodham Donne.—The death is announced of Mr. Bodham Donne, formerly the licenser of plays. Mr. Donne, who was an excellent scholar and for many years promised the learned world an edition of Tacitus, was at one time the Librarian of the London Library.

THE SCIENTIFIC REVIEW

AND

Scientific and Literary Review

INCORPORATING THE "JOURNAL OF THE INVENTORS' INSTITUTE."

JULY, 1882.

THE CHANNEL TUNNEL.

THAT the SCIENTIFIC REVIEW should in any way oppose the Channel Tunnel between England and France as an engineering project, or as a great improvement in international locomotion, would be deemed an absurdity; but as Englishmen, having the deepest patriotic interest in such a question, and as not being excluded from the consideration of Military Science which may be of general public benefit, we think it desirable to place before our readers a German opinion on the projected Channel Tunnel, by a German Officer, the translation having been made and printed for circulation (in order that the importance of the subject as it appears to a friendly foreign expert critic may be seen by Englishmen) by Mr. T. J. Denne, of Red Hill, Surrey.

The English press is at the present moment very much excited as to the submarine tunnel which is to be built from Dover to Calais. Military authorities—at their head the chief of the English staff, Sir Garnet Wolseley—have opened fire; while, in opposition to them, important daily papers, with General Adye's assistance are bravely holding their own.

The Minister of War sent Sir Charles Ellice not long ago to Dover, to personally inspect the preparations and report on them.

If I (says our critic) venture to-day to show the importance of the intended new route from a military point of view, one will allow me, as a German officer, a certain objectiveness in the discussion—and this could only suffer damage—on account of the interest I take in the welfare of the English people, amongst whom I have lived for a long time, and whose military and naval development I have followed and discussed for many years.

Before I discuss the project of the tunnel, it is necessary for me to enlarge shortly upon the politico-military situation of the island, as only by these means is it possible to properly estimate the building of the tunnel.

England is to be reckoned among the great powers, thanks to its naval development and insular position, which have preserved it until now from a hostile invasion, &c.—the only power, and how proud thereof (!), having comparatively only a very small army, although many British generals and admirals have long ago pointed out the danger of this state of affairs.

The military profession of old has, through modern military guidance, become an "art," which must be exercised with a praiseworthy labour of love, knowledge, and penetration, with quick decision and energy. It demands an unlimited, severe course of training, thorough knowledge of the subject, and uninterrupted practice. An army wanting in this must be scattered by a well-disciplined and well-trained army like chaff before the wind. The experience of the last wars corroborates this irrefutably.

Did not the Crimean war show plainly the most astonishing inferiority of English military affairs, and have the experiences

which Great Britain has made in Afghanistan, in South Africa against the Zulus and Dutch Boers, perhaps without cause, awakened the fear that the English position in the world is seriously endangered if British military affairs are not thoroughly reformed? As a military man, one may well ask what is the result of the march to Kabul, which cost thousands of lives and millions of pounds? I cannot think that Gladstone's Liberal Government has done civilisation a service in again giving Afghanistan over to civil wars. It is quite certain that on account of the retreat of the English flag from that territory the prestige of Great Britain in the whole of Asia has suffered a great shock; and Russia, longing for the pearl of Asia, East India, does not hesitate to take advantage of this fact, for, while it remains at its post in Europe, it is marching forward in Asia, for till now has there been any boundary there to English and Russian designs? Where the Russian lance gets blunt, there English influence begins, and where the English sword is no more to be felt, the white Czar reigns. But the lance has lately shown itself sharp—the sword full of notches. Force must necessarily govern in those countries, which, on account of the barbarity of the tribes and races living in them, lay claim to the unenviable notoriety of being the most uncivilised in Asia.

The Crimean war, which I mentioned above, cost England enormous sums of money. She maintains, besides the militia, a very expensive standing army, formed on the basis of the old recruiting system; so that one can say with justice great expenses are not saved by the militia system. The difference is this: that the great expenses of the standing army are suitably divided over a long period, that is to say, the regular peace budget includes a part of the war budget; whereas, by the militia system, the enormous expenses are crowded into a short space of time, and that just at the critical period, namely, during the war. It need scarcely be mentioned that, from a national economy point of view, the first system is much more profitable than the last. But I will show quickly by figures the proof of my statement. The ordinary military budget of the North American Union was 15 million dollars. During the war, in 1865, it rose to the enormously high sum of 1031 millions.

Another important point is that with the militia system the army has, to a certain extent, to be formed during the war. It is clear that the fight cannot be commenced with energy, and quickly, by a few but strong blows, carried into the enemy's country, and brought to an end. For this reason, a battle between a State with a standing army and one with a militia system is an unequal match.

On this matter the author dilates further, and, as Germans and the great majority of foreigners usually do, in much ignorance of the real war-power of England for defence, our volunteers and yeomanry not being understood, and their ready expansibility in a great defence crisis not thought of.

After this necessary digression, our author remarks, I will pass to the question of the submarine tunnel. As to the completion of this undertaking, which until now exists only in fancy, now that the engineering of the present day has done such wonders, it will most probably succeed, if indirectly elemental forces do not stop it. Although on the English side, at the present moment, 1500 yards of the 7-ft. high and 5-ft. broad trial-borings are finished, the principal question at least cannot be answered, whether the grey chalk layer, which is under the white porous and not solid covering, will reach from one shore to the other of the Channel. The whole construction would be endangered by an ever so small but deep slit in the rocks, or if it penetrated a sand-layer. Now that the preliminary measures are giving such brilliant results, the disputing interests come keener to the front.

British commerce thinks it can no longer do without the tunnel—i.e., without a surer and quicker communication with the Continent; while the English capital is already taking into account and reckoning the profitability of this line. When one considers that the debt contracted by Russia to England for the building of Russian railroads represents almost £200,000,000 sterling, and that there are enough geese on the London Stock Exchange to continually lay golden eggs for the kingdom of the Czar, one can get some idea of the liquidity of the money of the modern Tyrians at the present moment. If there is any profit to be made English hands put the sword into the enemy's hand. This is one of the English liberties—the commercial one—which, elsewhere, one would call by a different name.

The military side of the tunnel is in the answer to the question—Is it to England's interest, from a strategical or tactical point of view, that it should be carried out—whether, in a word, the defence of England will gain or suffer by its completion? But that only a neutral military opinion can be placed at the side of Sir Garnet Wolseley's, is evident from the following grounds:—

As England, in a warlike entanglement with one of the great Continental Powers of Europe, would nearly always require to defend its own country, it would be absurd to build a new approach for the enemy, as, when the tunnel is completed, there would arise a new and important factor in the problem of warding off a hostile attack. When one thinks that up to to-day most of the English ports and shores, notwithstanding the warnings and Parliamentary negotiations, &c., are without the necessary means of defence—that forts and batteries commenced some time ago are still unfinished, and partly without armament, and others so lightly constructed that the defender must look out when firing the guns that he is not buried beneath the walls—the well-founded doubt arises whether Parliament would grant the large sums required in order to make Dover, that is to say, the anticipated entrance to the Channel Tunnel on the English side, from a place of not much importance to a fortress of the first class, to arm it and always have a strong garrison there ready for all emergencies. In Parliament such a proposal, or a similar one, would be sure to lead to a most animated discussion as to whether the tunnel could be easily destroyed or barricaded, and they would consider, if it were instantly fortified, it would suffice for the further task.

Even supposing that nothing, so far as human knowledge could tell, had been left undone, in order, at any moment, to close or destroy the tunnel, still the guarantee is wanting that the electric current for firing the mines, or the valves for letting the water into the submarine passage, would not at the last moment fail, or have been destroyed by the enemy, or by someone in the pay of the enemy, &c. Chance plays nowhere such a great role as in war, where it may happen that the torpedo cannot be properly launched, grenades explode too soon, the fuse fails, &c., &c. Truly these are experiences which one can only make in the history of war, or in camp, of which English engineers and shareholders know nothing, but who wish to enrich the world with a new wonder that will pay well—a voyage from England to all parts of Europe, without being sea-sick, besides admitting and offering many other little comforts of life, as, for example, that of finding the newest English morning newspapers on the Paris breakfast table.

(To be continued.)

MESSRS. CASSELL'S *Little Folks*, which contains information as to the Steam News-paper Printing Machine, is in the general contents of the July number a charming little book.

Proceedings of Societies.

ROYAL SOCIETY.

MAY 25.—The President in the chair.—The following papers were read: "On certain Geometrical Theorems," No. 2, by Mr. H. L. Russell,—"On Effects of Retentiveness in the Magnetisation of Iron and Steel," Preliminary Notice, by Prof. J. A. Ewing (Tokio),—"On Actinometrical Observations made at Mussoorie, India," by Mr. J. B. N. Hennessey,—"On the Cause of the Light-border frequently noticed in Photographs just outside the Outline of a Dark Body seen against the Sky, with some Preliminary Remarks on Phosphorescence," by Prof. Stokes.

ROYAL SOCIETY OF LITERATURE.

MAY 24.—Sir P. de Colquhoun in the chair.—Mr. J. H. Heaton read a paper "On the Origin, Manners, Customs, and Languages of the Natives of Australasia," in which he gave a rapid survey of the early history of Australia. He next gave an account of the native population from the time when they first came in contact with Europeans, and showed the usual consequence of such contact in their rapid extinction. He then treated of the customs of the people, and of the animal and vegetable life found to be indigenous in Australia, at the same time entering fully into the possibility of colonising the interior, which he considered to be more feasible than has been usually supposed.

ANTHROPOLOGICAL INSTITUTE.

MAY 23.—General Pitt-Rivers, President, in the chair.—A paper was read by the Right Hon. Sir H. Bartle Frere "On Systems of Land Tenure among Aboriginal Tribes of South Africa." The author indicated the points regarding which further inquiry is needed, and urged the importance of recording observations whilst it is still possible to obtain information from sources which in the course of another generation may be closed for ever by the extinction of races. The Zulu title to the lands in South Africa rests on force, the land being his property only so long as the occupant can hold it by himself or by the assistance of the chief who protects him. The tenure cannot be transmitted by inheritance without being constantly sapped by the influence of two institutions universally among the Zulus, viz., polygamy and slavery. Christianity has a special bearing on the subject of land tenure, because it is mainly through its agency, indirect as well as direct, that we may look for such changes in the customs of the races of South Africa as may civilise and settle them, and put an end to the ceaseless wanderings which have tended so powerfully to keep them in a state of ever-recurring barbarism. The author's impression was that the advancement and civilisation of the native tribes of South Africa depend greatly upon the extent to which individual tenure of property can be extended, whilst some patriarchal authority, such as seems inherent in the head of a family or kraal, is recognised and invested with some sort of magisterial and judicial functions sufficient to meet the every-day exigencies of village life.—The President opened the discussion with some remarks on the peculiarities of land tenure in various parts of the world, and was followed by Dr. Rae, Mr. Hyde Clarke, and Miss Buckland.

LINNEAN SOCIETY.

MAY 4.—Sir J. Lubbock, President, in the chair.—Dr. C. C. Gibbs was elected a Fellow.—The Council and Fellows passed a resolution sympathizing with the family of the late Mr. Darwin.—The Rev. R. I. M. M. ray called attention to specimens of

Carex montana obtained at Heathfield, Sussex, corroborating Mr. Roper's late rediscovery of the plant in that county.—Mr. J. Murison exhibited examples of *Helipterum eximium* from the Cape, *Ixodia Achilleoides* from South Australia, and jungle cotton from Nagpoor.—A paper was read by Prof. Dickie "On Himalayan Algae."—A communication was read "On New Varieties of the Sugar Cane produced by Planting in Apposition," by the Baron de Villa Franca and Dr. Glass, of Rio de Janeiro. In correspondence which have passed between the authors and Mr. C. Darwin, the latter had expressed doubts as to whether two varieties could affect the character of the buds produced by either, it appearing more probable to him that the so-called new variety was due to bud variation. The Baron de Villa Franca thereupon forwarded a document, signed by eight distinguished Brazilians, testifying to the fact that valuable varieties have been raised by the process in question. Dr. Glass furthermore describes in detail his early but fruitless attempts to graft two varieties of the sugar cane, though he succeeded with another monocotyledon, viz., *Dracæna*.—Mr. S. Grieve gave a notice of the discovery of remains of the great auk (*Aluu impennis*) on the island of Oronsay, Argyllshire. Wing and leg bones were obtained along with a various assortment of remnants of the guillemot, red deer, otter, seal, and other mammals, mingled with fish bones and shells. These were dug out of a mound which the author believes must in early times have been occupied by man. The exceeding rarity of airfowl remains in Britain gives a special interest to the record of their being found in these western isles.—Then followed the reading of "Notes on some Cape Orchids," by Mr. H. Bolus, wherein several new species were described, and other references given in elucidation of particular structural points of the flowers of certain forms, accompanied by a full list of the Cape orchids named by previous writers.—In a "Note on the Dimorphic Florets of *Catananche lutea*," by Mr. B. D. Jackson, he drew attention to the observations of M. J. A. Battandier respecting the occurrence of certain large single florets produced directly from the roots of this yellow-flowered composite. Mr. Jackson finds these florets in almost all the herbaria specimens in this country, though their presence may be overlooked from their resemblance to the scales of the root-stocks.—A paper was read "On the Claspings Organs auxiliary to the Generation Parts in certain Lepidoptera," by Mr. P. H. Gosse. After general remarks on the subject the author mentioned his method of manipulation, and proceeded to a description of the organs in question, finally dealing with the modification of the apparatus as observed in a very considerable number of species.

GEOGRAPHICAL SOCIETY.

MAY 22.—Anniversary Meeting.—Right Hon. Lord Aberdare, President, in the chair.—The following gentlemen were elected Fellows: Earl of Dalhousie, Capt. F. L. Symonds, Messrs. M. Bauer, I. Brook, E. Cazalet, T. E. Grice, H. G. Turner, and H. W. Williams.—The Founder's Medal for the Encouragement of Geographical Science and Discovery was awarded to Dr. G. Nachtigal, for his great journey in the years 1869 to 1875 through the Eastern Sahara, during which he explored the previously unknown regions of Tibesti and Baghirni, added much to our knowledge of Lake Chad, and returned by a route previously untrodden by Europeans through Wadai and Dafur to Upper Egypt; also for the carefully prepared narrative of his travels now in course of publication, which is illustrated by many maps, and contains a large amount of original information regarding the countries

he visited and their inhabitants.—The Patron's Medal was awarded to Sir J. Kirk, H.M.'s Consul-General at Zanzibar, for his long-continued and unremitting services to geography, first as a naturalist and second in command to Dr. Livingstone in the Zambesi expedition of 1858-1863, during which he took a prominent part in all the new discoveries and explorations, enriching the results by his scientific observations; and, secondly, by the great assistance he has since rendered to successive expeditions in East Africa during his many years' residence as H.M.'s Consul-General at Zanzibar.—The annual Geographical Medals offered by the Society to the chief public schools were then presented to the following successful competitors: Physical Geography—Gold Medal, H. L. Smith, Bristol Grammar School; Silver Medal A. R. Sharp, Dulwich College. Political Geography—Gold Medal, F. H. Becker, Dulwich College; Silver Medal, S. C. Farlow, Harrow School.—It was announced that the subject for the examination in 1883, both in physical and political geography, would be the Dominion of Canada.—The President announced the following awards: Murchison Grant for 1882 to Rev. T. Wakefield, for the services to geography rendered by him during his twenty years' residence in East Africa, and especially for his paper and map, published in the fortieth volume of the *Journal*, on "Caravan Routes from the Coast to the Interior," and his account of his "Fourth Journey to the Southern Galla Country," read at the Geographical Section of the British Association in 1879; also to aid and encourage him in the researches he is still making in that little-known region.—Back Grant for 1882 to Mr. H. E. O'Neill, H.M.'s Consul, Mozambique, "Towards the purchase of instruments for the important explorations in which he is engaged in the regions between Mozambique and Lake Nyassa."—The following gentlemen were elected as Council and Officers for 1882-3: President, Right Hon. Lord Aberdare; Vice-Presidents, Sir R. Alcock, Major-General Sir H. C. Rawlinson, Sir B. H. Ellis, Right Hon. Sir H. Bartle E. Frere, General Sir J. H. Lefroy, and R. H. Major; Treasurer, R. T. Cocks; Trustees, Lord Houghton and Sir J. Lubbock; Secretaries, Clements R. Markham and D. W. Freshfield; Foreign Secretary, Lord A. Russell; Councillors, J. Ball, Sir H. Barkly, E. H. Bunbury, Sir T. F. Buxton, Right Hon. Lord Cottesloe, R. N. Cust, J. Fergusson, F. Galton, Col. H. H. Godwin-Austen, Col. J. A. Grant, Sir J. Kirk, J. K. Laughton, Right Hon. Sir A. H. Layard, S. P. Low, W. Mackinnon, Capt. Sir G. S. Nares, Sir R. Rawson, General R. Strachey, Sir R. Temple, General Sir H. L. Thuillier, and Col. H. Yule.

BRITISH ARCHÆOLOGICAL ASSOCIATION.

MAY 17.—Mr. T. Morgan in the chair.—Mrs. Dent sent a plan of the Roman villa now being excavated in Spoonley Wood, about a mile from Sudeley Castle. It is a building of large size, a portion of the centre and a long projecting wing being already laid open. A corridor runs around both portions, while several pavements of elaborate design have been found, one being extremely fine. A hypocaust has also been met with. The find promises to be a remarkable one.—Mr. E. Walford described two Roman coins found at Hampstead, pointing to the presence of the Romans in the locality.—Rev. G. B. Lewis exhibited photographs of the little-known tapestries now preserved in Knowle Chapel, having been found in an attic several years ago by Lady Delaware. They are remarkably well preserved. They represent the Passion of our Lord, and were probably brought to Knowle by Archbishop Wareham.—Mr. G.

M. Hills read a short description of several examples of acoustic pottery found in ancient churches.—Sir H. Dryden exhibited a photograph of a remarkable chessman of Norman date, found at Northampton Castle.—Rev. S. M. Mayhew described a fine series of glass pottery carvings, and other works of much artistic merit.—The first paper was by Mr. J. Greenstreet, on the Camden Roll of Arms recently found by Mr. W. de Gray Birch in the British Museum, where it has remained for many years apparently unnoticed. It is the earliest known series of arms, there being 270 shields, and the length of the parchment being 5 ft. 3 in. It was in Camden's possession about 1605; but it dates from the time of Henry III. or Edward I.—The second paper was by Mr. E. P. Loftus Brock, on the remains now being excavated on the site of the new Stock Exchange. A large mass of mediæval walling has been found, of thirteenth and fifteenth century dates, the remains of a mansion of importance. A portion of a Roman pavement and much pottery have also been discovered. The mansion was probably that of John de Wangrave, who had licence to crenellate his dwelling 7th Edward II. Several drawings were exhibited by Mr. R. L. Cole, and Mr. W. Wilkinson contributed notes for the identification of the site.—The proceedings were brought to a close by a *résumé* by the Chairman of the recent visit to London of some of the country Associates.

NUMISMATIC SOCIETY.

MAY 18.—Dr. J. Evans, President, in the chair.—Messrs. T. Bliss and F. Freshfield were elected Members.—Mr. J. G. Hall exhibited a four-ducats piece of Ferdinand and Isabella of Spain (1474-154) struck at Segovia (Heiss. "Mon. Hisp. Crist.," i. pl. 20, fig. 60); also a denier of Stralsund, *obv.* MONETA SVNDENSIS and a broad arrow, *rev.* DEVS IN NOMINE TVO and a cross patée.—Mr. H. Montagu exhibited a proof in silver of the gold broad piece of Oliver Cromwell, also a rare half-groat of Edward III. with an annulet at the point of the tressure on each side of the king's head.—Mr. F. W. Pixley exhibited a copper coin of the North Borneo Company struck in the present year.—Mr. C. J. Rodgers exhibited nine silver coins of Cashmere bearing the names of different kings, but all dated in the year 842, the reason for which Mr. Rodgers was unable to explain.—M. J. P. Six communicated a paper on a unique silver stater of Cyprus, struck in the names of the two kings Nicocles and Demonicus, sons of Euagoras I., B.C. 410-374. The coin was probably issued shortly after the death of Euagoras. On the obverse is a seated figure of Zeus, and on the reverse a goddess standing, holding a patera and a branch. M. Six supposed this figure to have been copied from the famous colossal statue of Nemesis by Agoracritus, a pupil of Phidias. This statue was sculptured out of a block of Parian marble, abandoned by the Persians on the field of Marathon, whither they had brought it for the purpose of erecting a trophy in case they had gained the victory. It was preserved in the temple of Nemesis at Rhamnus in Attica, on the site of which the head and some other fragments were discovered and are now to be seen in the British Museum.—Mr. C. J. Rodgers communicated a paper on some coins of Nadir Shah struck in India.—Mr. J. F. Neck read a paper on a hoard of coins of Edward I. discovered at Northampton, in which he also made some remarks on the coinage of Edward II. and Edward III.

ZOOLOGICAL SOCIETY.

MAY 16.—Mr. O. Salvin, V.P., in the chair.—The Secretary read a report on the additions made to the menagerie during April, and called special attention to the

following birds, said to be new to the collection:—(1) A male rifle-bird (*Ptilorhis paradisea*), in immature and worn plumage, changing very slowly into the adult dress, but apparently in good health; (2) a pair of black-headed tragopans (*Cerionis malanoccephala*); (3) four Rüppell's parrots (*Paecephalus Rueppelli*), from Western Africa; (4) a western black cockatoo (*Calyptorhynchus naso*), conspicuously differing from the eastern *C. Banksi* in its smaller size; (5) a male Cabot's tragopan (*Cerionis Caboti*), making a fine addition to the gallinaceous series; and (6) two of the recently described Uvæan parakeet (*Nymphicus Uvæensis*).—There was exhibited, on behalf of Mr. H. Stevenson, a specimen of the dusky petrel (*Puffinus obscurus*) picked up dead in the neighbourhood of Bungay, Norfolk, in 1858.—Letters and papers were read: from the Rev. O. P. Cambridge, on some new genera and species of Araneidea: of the sixteen species described, two were from Caffraria, one from St. Helena, two from Ceylon, and the remaining eleven from the Amazons,—by Mr. W. A. Forbes, on a peculiarity recently observed in a young male specimen of *Pithecia satanas*, in which the third and fourth digits of both hands were completely "webbed,"—by Mr. A. W. Forbes, on certain points in the anatomy of the todies (*Todius*), and on the affinities of that group: he dissented from the views of most previous authors as to the close affinities of those birds to the Momotidæ, considering that they must form a group by themselves, to be called todiformes, of value equivalent to the Pici-, Passeri-, and Cypseli-formes of Garrod; there were many grounds for supposing that *Todius* is a very ancient form, more nearly representing the ancestors of the whole group of anomalognathous birds than any other living form,—from Mr. R. Trimen, on an apparently undescribed sunbird, obtained in the province of Mossamedes, South-Western Africa, which he proposed to name *Cinnyris Erikssoni*, after its discoverer, Mr. A. W. Eriksson,—by Mr. P. L. Selater, on a species of duck (*Anas gibberifrons*), examples of which had recently bred in the Society's Gardens,—and by Mr. W. E. Forbes, on some points in the anatomy of a rare Australian duck (*Biziura lobata*) from examples that had recently died in the menagerie.

CHEMICAL SOCIETY.

MAY 18.—Dr. Gilbert, President, in the chair.—The following papers were read: "On the Precipitation of the Alums by Sodid Carbonate," by Messrs. E. J. Mills and R. L. Barr. The authors have determined the quantity of alumina by varying quantities of sodium carbonate solution.—"On Rotary Polarisation by Chemical Substances under Magnetic Influence," by Mr. W. H. Perkin. The author has determined and compared the power which various organic liquors have rotating the plane of polarisation when under the influence of an electro-magnet; and he has calculated the rotary power possessed by the columns of liquid which would be formed by the condensation of unit columns of their vapours, or, in other words, the rotary power possessed by lengths proportional to molecular weight. The numbers thus calculated clearly indicate that the molecular magnetic rotary power increases *pari passu* with each increment of CH₂.—"On the Constitution of Amarin and Lophin," by Messrs. F. R. Japp and H. H. Robinson.

PHILOLOGICAL SOCIETY.

MAY 19.—Anniversary Meeting.—Mr. A. J. Ellis, President, in the chair.—Miss M. Haig was elected a Member.—The President read his annual address, commenting on the deaths of Dr. J. Muir, of Edinburgh, and Mr. H. Nicol, and containing reports by himself on the Society's Papers, on Stan-

ford's Dictionary of Anglicised Foreign Words, on Wenker's Speech-Atlas of North and Mid Germany, on Mr. Bridge's account of the Yaghan Language of Terra del Fuego, and on Mr. Man's and Lieut. Temple's papers on the Language of the South Andaman Islands; also reports by Dr. Murray on the Society's Dictionary; by Prof. Skeat on the English Dialect Society; by Mr. Pinches on Cuneiform Researches since 1874; by Mr. H. Sweet on Phonetics, General Philology, and Germanic Philology; and by Prof. Stengel on Romance Philology, 1875-82.—The following Members were elected Officers for the Session 1882-3: President, Dr. J. A. H. Murray; Vice-Presidents, the Archbishop of Dublin, Dr. W. Stokes, Rev. R. Morris, A. J. Ellis, H. Sweet, and Prof. A. G. Bell; Ordinary Members of Council, Very Rev. Dean Blakesley, E. L. Brandreth, Prof. C. Cassal, C. B. Cayley, R. N. Cust, Sir J. Davis, F. T. Elworthy, D. P. Fry, E. R. Horton, H. Jenner, Prof. R. Martineau, Prof. J. B. Mayor, J. Peile, Prof. J. P. Postgate, Prof. C. Rieu, Rev. A. H. Sayce, Rev. Prof. W. W. Skeat, H. Wedgwood, and R. F. Weymouth; Treasurer, B. Dawson; Hon. Sec., F. J. Farnivall.

THE INSTITUTION OF CIVIL ENGINEERS.

MAY 23.—Sir W. G. Armstrong, President, in the chair.—It was announced that the Council had recently transferred Messrs. W. H. Bidder, H. Dangerfield, E. B. Ellice-Ciark, A. C. Jenour, F. G. Lynde, W. P. Smith, J. Strachan, and R. Wilson to the class of Members; and had admitted ten Students. The last ballot for the session resulted in the election of four Members, of twenty-nine Associate Members, and of Sir D. L. Salomons as an Associate.

HISTORICAL SOCIETY.

MAY 20.—Mr. C. Walford in the chair.—The following were elected Fellows: Mrs. A. Serruys, Rev. T. Addyman, Rev. D. Maginnis, Messrs. E. J. Burgess, T. J. Croggon, and G. M. Savery, and Prof. L. J. Woodroffe.—Mr. Hyde Clarke read a paper "On the Iberian and Belgian Influence in Britain."—A discussion followed, in which Messrs. Karl Blind, P. Harrison, S. Pagliardini, and Alderman Hurst took part.

PHYSICAL SOCIETY.

MAY 20.—Prof. Fuller in the chair.—Prof. W. C. Roberts gave the results of his repetition of Prof. W. Spring's experiments on the union of finely divided particles of metal by pressure. Prof. Roberts exhibited an alloy prepared by him which melts under 100° C., although of the constituent metals none has a lower melting-point than 230° C.—Mr. W. Baily showed mathematically that in Prof. Guthrie's magneto-electro experiment exhibited at the last meeting the repulsion between magnet and copper disc varies as the square of the velocity of the disc.—Mr. Lecky and Prof. Macleod gave some results of tests of Mr. Bennet's cell.—Mr. C. V. Boys exhibited an improved form of his vibratory electric current meter.

ARISTOTELIAN SOCIETY.

MAY 15.—Mr. S. H. Hodgson, President, in the chair.—Dr. J. Burns-Gibson read a paper "On Occam and the Critics," which was followed by a discussion.

MUSIC LEAF TURNERS.—Mr. James R. Burville, of Bainbridge, Ohio, has painted an improvement in music leaf turners. This device is designed for turning the leaves of music without attention from the player, except to touch a key, which liberates one leaf after another.

JOHN SCOTT RUSSELL, F.R.S.

THE death of Mr. Scott Russell, the eminent naval architect, took place at Ventnor, on Thursday, 8th June. The Society of Arts loses an old member, and a former Secretary who held office during five important years of the Society's history. Mr. Russell was originally elected a member on November 20th, 1844, and took an active part in the deliberations of the Committee of Miscellaneous Matters, which at that period, before the Council was appointed, had the chief management of the Society's affairs. In July, 1845, he was appointed joint Secretary with Mr. Whishaw, and subsequently he became sole Secretary. At the time of his election action was being taken for the purpose of arranging a series of national Exhibitions, and it was during his Secretaryship that the Society was incorporated by Royal Charter. Out of the national Exhibitions grew the idea of an International Exhibition, which was carried out in 1851, under the auspices of H.R.H. the late Prince Consort, President of the Society. In arranging the various steps by which this great undertaking was brought to a successful issue, Mr. Russell took a prominent part; and in January, 1850, when a Royal Commission for the promotion of the Exhibition was appointed, he was appointed joint Secretary, with Mr. (now Sir Stafford) Northcote. Shortly after this he resigned the office of Secretary of the Society, and was placed on the Council at the next annual meeting. In 1854, he was elected a Vice-President. Mr. Russell was born in the year 1808, and was, therefore, 36 years of age when he came from Scotland to London, and joined the Society of Arts. He had then attained some distinction, both as a scientific man and as a naval architect. In 1832, he had been selected to fill the temporary vacancy in the Professorship, on the occasion of the death of Sir John Leslie, Professor of Natural Philosophy at Edinburgh University. Soon afterwards, he began his life-long researches on the nature of waves, and his first paper on the subject was read before the British Association in 1835. Two years later he received the gold medal of the Royal Society of Edinburgh, for a paper on "The Laws by which Water opposes resistance to the motion of Floating Bodies." He was employed for several years as manager of the shipbuilding establishment at Greenock, now belonging to Messrs. Caird and Co., and during this time he designed and built several large vessels, on the system laid down by himself. Mr. Russell was elected a Fellow of the Royal Society in 1849, and in 1860 he built the *Great Eastern*, which was the great work of his life, and that by which his name will probably be longest remembered. He was one of the founders of the Institute of Naval Architects, and contributed no less than twenty-one papers to the Transactions of that Society. One of these was on "International Communication by Railway Steamships;" and to show how much this subject interested him, it may be added that his last work of naval construction was the steamer on the Lake of Constance, which carries railway trains between the termini of the German and Swiss railway systems on the opposite shores of the lake. Although he was first of all a naval architect, he did not confine his energies to that branch of engineering. In early life he constructed steam carriages for common roads, which ran between Paisley and Glasgow. He was greatly interested in the question of technical education, and, in 1859 he delivered a lecture at the South Kensington Museum, which he entitled, "What should Mechanical Workmen be Taught?" In 1869, he published a work on "Systematic Technical Education for the English People," and he gave much earnest attention to the movement of the Inventors' Institute, some years ago, though it

was a matter of sympathy and not of positive business, and was not then open to popularity-mongering, so as to suit the Society of Arts.

THE HARVEIAN ORATION.—On Saturday, June 24, the annual Harveian oration was delivered at the Royal College of Physicians by Dr. George Johnson, F.R.S., Fellow of the Royal College of Physicians, Professor of Clinical Medicine in King's College, and Senior Physician to King's College Hospital. Dr. Johnson began his oration by referring to the systematic attempts which have recently been made in Italy—first, to deprive the illustrious Harvey of the honour which for two centuries and a half has by almost universal consent been conceded to him as the discoverer of the circulation of the blood; and, secondly, to claim for the Italian Cesalpino the credit of having anticipated Harvey. In 1876 a monument in honour of Cesalpino was uncovered in Rome. At the inauguration of that monument, in the presence of a large assembly of Italian notables, orations were delivered by Professors Scalzi and Maggiorani. Both orators referred in terms of praise to a recently-published work ("La Scoperta della Circolazione del Sangue," Milano, 1876) by Dr. Ceradini, Professor of Physiology in the University of Genoa. The author of this work professes to give the true history of the discovery of the circulation, and he maintains that Harvey, during the four years, from 1598 to 1602, which he spent as a student of medicine at Padua, learnt from the writings of Cesalpino, the chief of which had been published about thirty years before, the doctrine of the circulation which in the year 1628 he published as his own. Dr. Ceradini admits that Harvey, having undergone great labour in his endeavour to make the doctrine known, and to overcome the prejudices of those who opposed it, may, to some extent, be pardoned for having at length persuaded himself that Cesalpino's discovery was actually his own; but this, he maintains, affords no excuse for the conduct of Harvey's fellow-countrymen, who still believe, or pretend to believe, him to have been the discoverer of the circulation, perhaps, he sarcastically adds, in order not to deprive themselves of the pretext for an annual festal celebration of his memory. Dr. Johnson then proceeded to show how utterly without foundation are these charges of plagiarism against Harvey, who could not have obtained from Cesalpino's writings that which is not to be found therein—namely, a knowledge of the circulation of the blood. It was proved by quotations from Cesalpino's works that in no respect was his knowledge of the circulation in advance of that of his contemporaries and immediate predecessors. Harvey was the first to describe not only the course of the blood through the systemic vessels, but also the true function of the heart as the means by which the blood is constantly propelled from its left side through the arteries over the whole system, and thence through the veins to the right side of the heart, whence, passing through the lungs, it completes the circle by again reaching the left side. The orator concluded by saying that, Harvey having obtained his knowledge of anatomy at Padua under the famous Fabricius, although we cannot concede to Cesalpino the honour of having discovered the circulation of the blood—a distinction which he himself would probably never have thought of claiming—we willingly express our gratitude to Italy for having given our celebrated countryman the anatomical training without which he could not have made his great discovery—a discovery which throughout all ages and by all civilised nations will be looked upon as the foundation of modern physiology, and therefore of scientific medicine.

SYSTEMS OF GRINDING WHEAT, AND ON THE MACHINES USED IN CORN MILLS.

A PAPER on this subject was read before the Institution of Civil Engineers, on the 16th May, by Mr. W. Proctor Baker.

The author stated that it was impossible to discuss exhaustively in a short Paper the different processes and all the various machines used in modern corn-mills; but a general sketch of the conditions under which the trade was carried on in the United Kingdom, compared with those of competing countries, and a description of the systems in vogue and of the machines in use might be attempted. Wheat, originally ground in a pestle and mortar, or between rollers and a hard stone tablet, in both cases by hand-power, was by the Romans, at the time of the Christian era, ground by millstones, and a thousand years ago the millstone did not differ materially from that of the present day. The sifting of the meal, however, seemed to have been done by hand-labour, and the machines by which flour was dressed were products of quite recent times.

The Exhibition of Mill Machinery, in 1881, directed attention to the revolution taking place in the art of milling. The Hungarians and Americans had been credited with the possession of processes which the millers of this country were thought to have been slow to adopt, and consequently it was supposed they were in danger of losing their trade. It appeared, however, that these processes were combinations of machinery of recent introduction, but still well-known to British millers, and that they were not adapted to the manufacture, as it was obliged, by circumstances, to be conducted in this country. The flour to be obtained from any given description of wheat was not, as ordinarily supposed, all of one quality, which varied according to its position in the wheat-kernel.

The methods in general use made one flour of average quality from the grain, which was of a description that met a ready sale. The Hungarians and Americans divided and sub-divided the qualities from one wheat, the former into as many as ten or twelve different sorts, the latter into a smaller number; and as different markets required different qualities, they were able to find a market for the whole series of qualities, sending each to an appropriate market. But the home miller was obliged to make, for his own local demand, the particular quality which the district required, because the home market was his only market. As a rule, only one quality of flour being required in the district within reach of a mill, the home miller was debarred from using processes whose success depended on finding markets for several qualities, and especially on selling the very fine flours at high prices.

The system in general use up to about ten years ago was low grinding, by which it was sought, at one operation, to crush the kernel of the wheat into flour, and at the same time completely divide the flour from the bran. Lately, the tendency had been not to complete the grinding at one operation, but rather to proceed on a system known as "gradual reduction." The reason for the change of practice was, that in low grinding not only was the interior of the grain crushed into minute particles known as flour, but, at the same time, the bran being brittle, broke, or a portion of it was broken, into equally small particles, and these became inextricably mixed up with the flour and could not be separated from it.

The presence of these particles in the flour gave a dark colour to bread made from it. A system based on the Hungarian procedure had come into use in order to avoid this disadvantage. It was sought, while dividing the bran from the interior of the

grain, to break up the latter, not into flour, but into fragments of the size of a very small pin's head, known as "semolina," or "middlings." But in doing this, particles of bran were still broken up and mixed with the semolina. The semolina was, however, large enough to be subjected to a winnowing operation, performed by an appropriate machine called a "purifier;" this separated the branny particles, and left the "semolina" pure, being, in fact, small fragments of the wheat without mixture of bran. The fragments were crushed by roller-mills or millstones to flour, and gave a pure flour free from specks. Not only, however, was it possible thus to separate the bran, but as the semolina varied in density according to its position in the wheat corn, and as that which was most dense gave better flour than the less dense, the semolina itself was graded in quality according to its specific gravity, and each grade being ground separately gave a different quality of flour. Thus, several different qualities of flour were obtained from the same wheat. To get semolina instead of flour, it was necessary to subject the wheat to a cracking rather than to a crushing action in grinding, and for this purpose the grinding had to be accomplished at repeated operations, hence the system was named "gradual reduction." Between it and "low grinding" there were several other systems, as "high grinding," "half-high grinding," and others, depending on the lesser or greater amount of crushing power used in the initial operation of grinding.

The wheat of commerce delivered to the miller contained all manner of seeds, dirt, stones, nails, and articles inappropriate for flour-making, which it was necessary carefully to remove. A considerable number of machines, performing different functions, had to be provided for the thorough cleansing of the wheat, removing all dust and polishing it, before it was ready to be ground. The grinding which was formerly accomplished altogether by millstones, was now in some cases entirely, and in other cases at some stages, performed by roller-mills. The use of these was extending. The designs were various, but there were certain points which experience had shown must be common to all good roller-mills. It had been established that the best materials for the roller were chilled cast iron or porcelain. The former might be used for grinding wheat or semolina, the latter was fit for soft semolinas only. The chilled iron was hard enough and tough enough to bear the severe friction of wheat-grinding without material wear, a friction that porcelain would not stand; but on account of the slight porosity of the surface, porcelain was preferred by some for grinding soft semolina. As considerable pressure was used in grinding semolina, the rollers were apt to heat, and it was found that rollers of about 15 inches in length were the longest that could be usefully employed, while other considerations fixed the diameter at about 9 inches. Rollers for grinding semolina had smooth surfaces, and might run at equal or differential speed; rollers for grinding wheat were grooved or fluted, and ran always at differential speeds. Pressure was applied through the bearings in various ways, by levers, wedges, springs, or screws; but the design of Mechwart, of an anti-friction ring-pressure, afforded the means of applying heavier pressure than any other roller-mill. All other things being equal, the roller-mill which gave the operator the power of putting the greatest pressure on the material to be ground was the best. Another novelty was the centrifugal silk dressing-machine, which consisted of a cylinder slowly revolving, through which the flour was driven by beaters running at a high speed inside it. This machine was almost a necessary accompaniment of the

roller-mill, as the meal ground by rollers had a tendency to cake, and the beaters were needed to break up the cakes. But the most important machines of recent introduction were the "Purifiers," which were used for the purpose of purifying and classifying the semolinas. These machines worked either on the principle of causing the semolina to pass through a series of pass through a series of passages, where it was exposed to currents of air, which first removed the bran, and then, as it were, weighed the semolina and divided it; or by centrifugal force the semolina was scattered in a shower, and divided in consequence of the heavy particles flying farther than the light ones; or by an arrangement by which the semolina was made to traverse a long sieve, which had a rapid juggling or oscillating motion. In the latter case the motion caused the heavier particles to sink to the surface of the sieve, and the lighter ones to float on the heavier ones. A pressure of air was kept up under the sieve just sufficient to prevent the light particles from falling through the meshes, while the heavier particles which were heavy enough to overcome the air pressure, fell through the sieve and were collected at the bottom of the machine. An exhaust above the sieve carried away the lightest particles, and all but the lightest and the heaviest passed away into a receptacle at the lower end of the sieve. The purifier was of more importance in the modern processes than the roller-mill, for the work of the latter might be done by the millstone, while without the purifier neither the mill stone nor the roller mill could make pure or the finest flour. As the taste for whiter bread appeared to be on the increase, an extension of the high-grinding systems might be expected.

LITERARY NOTES.—According to the *Academy*, the Earl of Crawford and Balcarres has lent Mr. Furnivall—for reproduction in the series of Charlemagne romances of the Early-English Text Society—his unique copy of Sir Johan Bouchier, Lord Berners's englisht "booke of Duke Huon of Burdeux," printed by Robert Redman about 1535. To M. Gaston Paris is due the suggestion that this Boke should be included in the Charlemagne series. It will be edited by Mr. Sidney S. Lee, of Balliol. Dr. Alois Brandl is writing a book on Coleridge, tracing the influence of Herder and other German authors on him, and his influence on the writers of his time and those who succeeded him. He has unearthed from *The Times* of 1811 its report of Coleridge's fourth lecture on Shakespeare, of which Mr. J. P. Collier had lost his notes when he published Coleridge's Shakespeare Lectures, and has collected a good many odds and ends new to most Coleridge readers. Dr. Bernhard Weiss, professor at Berlin, has just published volume 1 of a new "Leben Jesu," which claims to be at once critical and in accordance with traditional views of the person of Christ. The second volume of the correspondence of George Sand was issued in Paris recently (Calmann Lévy), covering the period from 1836 to 1847. Among the most interesting is one addressed to Lamennais in 1837, when she was publishing in his paper—the *Monde*—her "Lettres à Marcie." In it, while stating her own opinions upon the question of divorce, she leaves herself entirely in his hands. Later are two letters describing her visit to Majorca, in company with Chopin, in December, 1838; and also a very characteristic one to Mazzini. Mr. W. H. Rylands has done a great service to students by reproducing in the last number of the "Transactions" of the Society of Biblical Archaeology all the known Hittite inscriptions, or, as he prefers to call them, "the inscribed stones from Jerabis, Hamath, Aleppo, &c."

MODERN FLOUR-MILLING IN ENGLAND.

THE following Paper on this subject was read before the Institution of Civil Engineers, on the 16th May, by Mr. HENRY SIMON.

The importance of the flour-milling industry of the United Kingdom was first noticed: as much as £2,000,000 per annum being turned over in a single milling establishment in London. Much flour was also imported from Hungary and the United States, especially from the latter country. The quantity of wheat ground in England in one year was more than 25,000,000 quarters, and for the whole of Europe the daily expenditure for cereals to be ground was about £1,500,000. It was stated that flour produced by roller-mills in England was worth 2s. 6d. to 5s. more per quarter than that ground by stones, the wheat being of the same quality. The systems of low-grinding and high-grinding were then referred to. The former, until recently, was the general practice in this country, the latter was the rule in Hungary and in America. The difference between the two systems was explained. It was stated that the action of low-grinding was violent, producing heat which spoiled the flour in colour, and in baking and keeping quality, and that the damping of wheat in low-grinding was detrimental to the quality of the flour. High-grinding was carried on without damping or steaming; the bran and germ were taken out, and the flour kept well. The fundamental principle of high-grinding was gradual reduction of the grain, the branny particles being carefully separated before each succeeding step in the manufacture, for which purpose five or six breaks were sufficient. Millstones were being gradually dispensed with; all improvements now in progress in this country were in the direction of high-grinding with roller-mills. Low-grinding with roller-mills produced less flour and of inferior quality. Whole-meal flour was the product of the lowest step of low-grinding; the highest Hungarian brands came from the highest grinding, the equal of which was now being produced in this country. The evolution of roller-mills was then detailed. Their first practical application was in Budapest, in 1839. The flour ground by rollers moving at equal speed was caked or flaked; differential speed was important, and the purification of the products before proceeding with further reduction. The first rollers, although adjustable in distance, were kept rigidly in place; the advantage of Wegmann's improvement was the fixing of the journals of the rolls in levers, acted upon by weights or springs. Wegmann had also introduced porcelain rollers, but these were not so durable as chilled iron rollers, and were not applicable for granulating grain. The different ways of driving roller-mills by straps or gearing were mentioned, and serious drawbacks to the former pointed out. The various methods of fluting the rollers were described; sharp-edged grooves had proved the best, with from ten to thirty grooves in the space of an inch. Vertical grooves, and grooves parallel to the axis, had been used. Reference was then made to Carr's Disintegrator, and to Nagel and Kaemp's system. The author next pointed out the advantages of roller-mills over stones, among them being the fact that the former flattened the bran and germ, which could then be easily dressed out, and did not attack them. The expense of repairing the rollers was small as compared with dressing the stones; the product of flour was as great, there was less danger of explosions, less space was occupied by roller-mills, and much less power was required. A statement was given of the power required in three of the mills erected by the author. Roller-mills were introduced into England by Buchholz in 1862, but the results were unsatisfactory. The Hungarian process was

introduced by Oexle in 1868; later an impetus was given to roller-milling by Wegmann's improvement of porcelain rollers, and "middlings," formerly a drug in the market, now became valuable. The system advocated by the author was introduced on an experimental scale in 1877, and, since the Kilburn Exhibition of 1879, had met with general acceptance. The fundamental principles of this process were—first, gradual reduction of the wheat by fluted rollers with sharp corrugations; secondly, cleaning of the bran by fine fluted rollers, all with differential speed; thirdly, gradual reduction of the semolina principally by smooth rollers, or in some cases of fine fluted rollers. A description of machinery used in the author's system was given. This included (1) Daverio's roller-mill, the principal feature of which was cross-fed channels and effectual friction-relief; also three rollers gave the same work as four rollers in other mills. (2) Dressing machinery; it was stated that the ordinary silk reel was now displaced by the centrifugal reel; the centrifugals recommended by the author were described, and the different classes of centrifugal reels made. (3) Purifying machinery. Finally the paper contained a description of the modern high-grinding process by roller-mills. This was divided into three main operations: granulation, or the separation of the outer husk of the grain; purification of the product thus obtained from bran; and the gradual reduction of the purified semolina into flour. These different operations were fully described, illustrated, and explained.

A GELATINE EMULSION FOR DIRECT PRINTING.

UNTIL quite recently the application of gelatine emulsion has been confined almost entirely to negative work, except so far as its employment for enlarging purposes is concerned; at least, there has been no serious attempt to adapt it to direct printing on a small scale, and for the same class of work as that for which the collodio-chloride was used. Opal plates have certainly been an article of commerce in this country for some time; but the results were obtained by development, and possessed none of the richness of tone obtainable with collodio-chloride or albumen films, or even with developed collodion plates. During the last few months, however, gelatine chloride emulsion has gained a footing, owing mainly to the discovery of improved methods of development; and from accounts reaching us from all sides we learn that it is rapidly progressing in popular favour. Dr. Eder, Captain Abney, Mr. B. J. Edwards, and others have demonstrated how it is possible, by suitably modifying the exposure and development, to secure almost as great a range of tone as with albumenized paper; and for opal work, as well as for transparencies of all kinds, developed gelatine-chloride images appear to be admirably adapted.

For these purposes, however, the operation of development presents an objectionable feature—a slight degree of uncertainty as to the exact character of the tone that will be obtained. However carefully the exposure may be timed and the developer regulated, it is scarcely possible to insure a perfectly uniform class of results, and for this reason a method of direct printing has been a desideratum. Gelatine chloride plates may, it is true, be used for direct printing; but the tones obtained are unpleasing, and the general character of the image anything but satisfactory; while, as Captain Abney recently pointed out the chief difficulty lies in the fact that it is nearly entirely removed by the fixing solution. The same difficulties attended the early days of collodio-chloride emulsion. The images produced were thin and feeble, and, even if they presented any

amount of vigour before fixing, that operation entirely removed it, leaving a weak, gray image of little pictorial value. By the use of a highly organic collodion matters were slightly improved; but it was not until the addition of citric acid or of an alkaline citrate was made to the emulsion, with an excess of silver nitrate, that anything like success was attained. The presence of a highly organic compound of silver was, in fact, found to be absolutely necessary for the production of vigour and richness of tone.

At the meeting of the Photographic Society of Great Britain, on the 9th of May, Captain Abney, in the course of his remarks on various methods of printing, and on the action of light on various compounds of silver alluded to the marked effect that citrate of silver has of increasing the vigour of the impression caused by the direct action of light upon silver chloride in gelatine. The rough examples which were passed round showed in an unmistakable manner the value of this addition; for, not only is the image produced robust and vigorous, and capable of thoroughly withstanding the lowering action of the fixing bath, but it possesses a rich red colour, somewhat resembling an untuned albumen print, which seems to promise the possibility of securing any desired tone by the application of suitable means. Indeed, Captain Abney informs us that these images lend themselves with facility to the production of any of the tones obtainable with albumenized paper, while the printing occupies but one-third of the time.

The emulsion is formed in the ordinary manner. An alkaline chloride and an alkaline citrate in proper proportions are dissolved in a solution of gelatine, and this is sensitized by the addition of silver nitrate. When a sufficient time has elapsed to admit of complete combination, the emulsion is washed and redissolved in the ordinary way, and is then ready for use either on glass or paper. It will be observed that, unlike collodio-chloride (or, as Captain Abney justly calls it, "collodio-citro-chloride"), there is no free silver present in any stage of the emulsion, and it may, therefore, be assumed that when dry the films will retain their properties unchanged for an indefinite period. In the presence of excess of silver nitrate we know that gelatine will sooner or later discolour spontaneously. The proportions of silver chloride and citrate mentioned by Captain Abney are about two of the former to one of the latter, though it is possible that these may be modified upon further trial. The films, before exposure to light, are extremely thin and opalescent, and certainly do not appear capable of giving the density of coloration which is obtained with them.—*Br. Jour. of Photo.*

CONVERSAZIONE OF THE SOCIETY OF ARTS.—The Society's Conversation was held at the South Kensington Museum (by permission of the Lords of the Committee of Council on Education), on Wednesday, 14th June.—The Galleries containing the Raphael Cartoons, the Sheepshanks Collection, the Wm. Smith Collection of Water Colour Drawings, the Dyce and Forster Pictures, the Collection of Paintings lent by the Trustees of the late Rev. Pryce Owen, and "The Chantry Bequest," as well as the Courts and Corridors of the Ground Floors were open. The Reception was held in the Architectural Court, by Sir Frederick Bramwell, F.R.S., Chairman, assisted by the following Vice-Presidents and Members of the Council:—Mr. Andrew Cassels, Lord Alfred S. Churchill, Mr. B. Francis Cobb, Admiral Sir E. Inglefield, C.B., F.R.S., Sir Philip Cunliffe Owen, K.C.M.G., C.B., Lieut.-Col. Donnelly, Mr. W. H. Perkin, F.R.S., Mr. Loftus Perkins, Mr. W. H. Preece, F.R.S., and Mr. R. Rawlinson, C.B.